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EXAMINER	
CHANG, AUDREY Y	

ART UNIT	PAPER NUMBER
2872	

DATE MAILED: 10/07/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/671,557	KIM ET AL.	
	Examiner	Art Unit	
	Audrey Y. Chang	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-22 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-22 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 1/6/2004.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. **Claims 14 and 15-22 are objected to because of the following informalities:**

(1). Claim 14 recites the phrase "a polarization direction of said laser beam is determined so that the difference between the refractive index of said phase diffraction grating member and refractive index of said phase modulation member is maximized" that is confusing and indefinite. Firstly it lacks proper antecedent basis for "said laser beam". Secondly it is not clear how could the difference in refractive indices be "maximized" as the polarization direction of the laser beam is "determined". The maximization in the difference in the refractive indices is by selecting the materials for the two members and by applying the voltage across the modulator. It is not clear how does the polarization direction of the laser light has anything to do with the maximization in difference.

(2). Claim 15 recites a phase diffraction grating member yet in its dependent claims 18-22, a plurality of light sources with *different color* of light is used. It is known in the art that a diffraction grating generally diffracts one wavelength of light. It is not clear how could the one phase diffraction grating member is capable of diffracting more than one wavelengths of light or multiple color of light.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. **Claims 1-4, and 6-12 are rejected under 35 U.S.C. 102(b) as being anticipated by the patent issued to Yamanobe et al (PN. 4,822,146).**

Yamanobe et al teaches an *optical modulation element*, serves as the *dynamically controllable light modulator,* wherein the modulation element comprises a *phase diffraction grating member* (2, Figure 1), having a diffraction grating *portion* with periodically varying thickness formed on one surface of the phase diffraction grating member and a *variable refractive index material* (1) serves as the *phase modulation member* whose one surface is attached to the diffraction grating portion of the phase diffraction grating member and *transparent electrodes* (3) formed on the other surfaces of the phase diffraction grating member and the phase modulation member, (please see Figures 1, 5A to 5C and column 3).

With regard to claims 2-4, Yamanobe et al teaches that the electrodes are transparent electrodes that are formed by coating glass substrates with ITO films, (please see column 6, lines 3-15).

With regard to claim 6, Yamanobe et al teaches that the phase modulation member or the variable refractive index material (1) is provided only in the concave portions of the diffraction grating portion, (please see Figure 1).

With regard to claim 7, Yamanobe et al teaches that the diffraction grating portion of the phase diffraction grating can assume square, harmonic or triangular functions in the variation of the thickness, (please see Figures 1, 5B and 5C, and column 7, lines 1-12).

With regard to claim 8, Yamanobe et al teaches that the refractive index of the variable refractive index material (1) is changed by applying different voltage across via the electrodes.

With regard to claims 9-11, Yamanobe et al teaches that the variable refractive index material (1) may be liquid crystal material, which is an electro-optic crystal, or material such as MNA which is a form of nonlinear chromophore, (please see column 7, lines 17-22).

With regard to claim 12, Yamanobe et al teaches that by applying the voltage across, the refractive index of the variable refractive index material can be changed so that together with the phase

diffraction grating member, periodic portions of different refractive indices can be achieved which therefore forms a Bragg grating, (please see Figures 5A to 5C).

This reference has therefore anticipated the claims.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Takahara et al (PN. 5,477,351) in view of the patent issued to Yamanobe et al, (PN. 4,850,681).

Takahara et al teaches a liquid crystal panel, serves as the *dynamically controllable light modulator,* wherein the panel comprises a *diffraction grating member* (27, Figure 4(a)), having a diffraction grating *portion* with periodically varying thickness formed on one surface of the diffraction grating member and a *variable refractive index liquid crystal material* (26) serves as the *phase modulation member* whose one surface is attached to the diffraction grating portion of the phase diffraction grating member and *electrodes* (23 and 24) formed on the other surfaces of the phase diffraction grating member and the phase modulation member, (please see Figure 4(a) and column 7, lines 19-37). Takahara et al teaches that the electrode (23) is a reflection electrode made of a *metallic film* such as aluminum, (please see column 7 line 25), to make the liquid crystal panel of a reflection mode.

This reference has met all the limitations of the claims with the exception that it does not teach explicitly that the diffraction grating is of a *phase* type diffraction grating. However this feature is either inherently met by the disclosure, (since the diffraction grating is based on the difference in *phase* in

different grating portion and the liquid crystal portions) or an obvious modification to one skilled in the art since as taught by **Yamanobe** et al phase type diffraction grating is generally used in a dynamical controlled optical modulator, (please see column 6, lines 46-50), for the benefit of making the diffraction grating only gives phase modulation and not amplitude modulation to the incident light to preserve the light intensity of the incident light.

6. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Yamanobe et al, (PN. 4,822,146).

The dynamically controllable light modulator taught by Yamanobe et al ('146) as described for claim 1 above has met all the limitations of the claims.

Yamanobe et al does not teach explicitly to use a *laser* light source for generating the incident light however laser light source is one of the most used light source in the art such modification would have been obvious to one skilled in the art for the benefit of using standard light source for the light modulator.

With regard to claim 14, Yamanobe et al teaches that with respect to particular polarization component of the incident light (such as component 60 or 61, please see Figure 1 and column 4), the *diffraction efficiency* of the particular polarization component is a function of the difference in the refractive indices of the diffraction grating member and the variable refractive index material, (i.e. either of ordinary or extraordinary refractive index), (please see column 4, lines 1-32).

7. Claims 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over the patent issued to Yamanobe et al (PN. 4,850,681) in view of the patent issued to Takahara et al (PN. 5,477,351).

Yamanobe et al teaches a *optical modulation device* that can be used as a variable color *display device* wherein the device comprises a *phase diffraction grating member* (2, Figure 1), having a diffraction grating *portion* with periodically varying thickness formed on one surface of the phase diffraction grating member and a *variable refractive index material* (1) serves as the *phase modulation member* whose one surface is attached to the diffraction grating portion of the phase diffraction grating member and a plurality of **stripe-like** *electrodes* (3) formed on the other surfaces of the *variable refractive index material* or *phase modulation member*, (please see Figures 1, and column 2, lines 57-67 and column 3, lines 40-69). The device further comprises a electrode (3) formed on the surface of the phase diffraction grating, (please see Figure 1) and a power supply is included, (please see Figure 5A), for supplying the voltage across the device to control the refractive index of the phase modulation member. Light source is implicitly included for generating the incident light.

This reference has met all the limitations of the claims. The stripe-like electrodes are considered to be *patterned* electrodes which is in two dimensional array at the positions of the variable refractive index material (1). However this reference does not teach explicitly that the other electrode (3) is a *common* electrode. **Takahara** et al in the same field of endeavor teach a liquid crystal display panel with a diffraction grating wherein a common electrode (23, Figure 4(a)) and a plurality of patterned pixel electrode (24) are sued to control the display panel. It would then have been obvious to one skilled in the art to apply the teachings of Takahara et al to modify the arrangement of Yamanobe et al to use patterned electrodes and common electrode for the benefit of having good individual control of each pixel as well as save cost for using a common electrode for the display.

With regard to claims 16 and 17, Yamanobe et al teaches that the electrodes are transparent for providing transmission type of display device, Takahara teaches metallic electrode (23, column 7, lines 25-30) may be used to provide a reflection type display device.

8. Claims 18-22 rejected under 35 U.S.C. 103(a) as being unpatentable over the patents issued to Yamanobe et al (PN. 4,850,681) and Takahara et al as applied to claim 15 above, and further in view of the patent issued to Popovich (PN. 6,185,016).

The optical modulation device used in a color display device as taught by **Yamanobe** et al in combination with the teachings of **Takahara** et al as described for claim 15 above have met all the limitations of the claims. Yamanobe et al teaches that the display device may be of a variable color display device which implicitly means the light source used includes different color of light. However these references do not teach explicitly to use separate laser light sources of primary colors. **Popovich** in the same field of endeavor teaches a color display device using controllable optical modulator including gratings, wherein a plurality of illumination laser light sources for generating red, green and blue color lights is used, (102-106, Figures 5 and 6). Popovich teaches that a scanner device (108) is used to make the plurality of color light to be illuminated on the image generation device in the same direction. Popovich also teaches to use a *reflective* element (112, Figure 5) to collimate different color image lights so that they direct at the same direction. It would then have been obvious to one skilled in the art to modify the display device of Yamanobe et al to use a plurality of laser color light sources and to use reflector means to collimate and direct the color image light in the same direction. Although these references do not teach to use a rotatable mirror for directing the image light however since rotatable mirror is very well known in the art for directing light beam such modification would then have been obvious to one skilled in the art for the benefit of using an easy means for achieving the same beam direction function.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Audrey Y. Chang whose telephone number is 571-272-2309. The examiner can normally be reached on Monday-Friday (8:00-4:30), alternative Mondays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Dunn can be reached on 571-272-2312. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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